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GB 2061845 A

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(54) Axle assembly

(57) A driven axle assembly comprises a unit which includes a carrier 26, a gear train 20 and brakes 23 and 33. When drive shafts 21, 22 have been withdrawn from the unit, the unit can be withdrawn from the interior of a housing body 30 for easy access to the gear train 20 and brakes 23 and 33.

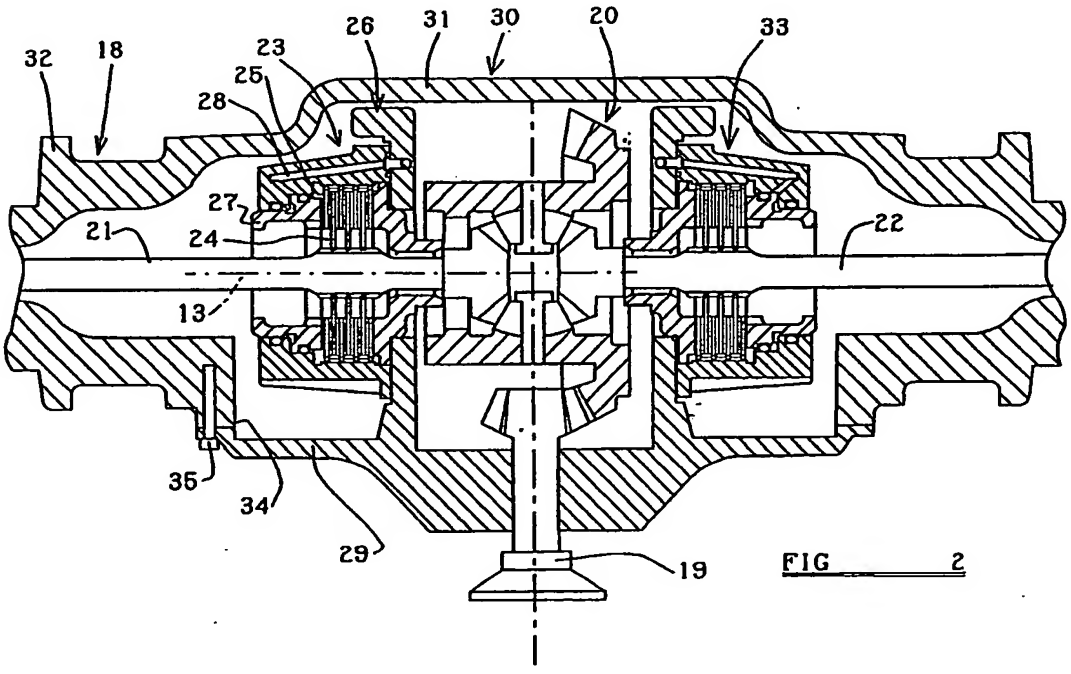

FIG 2

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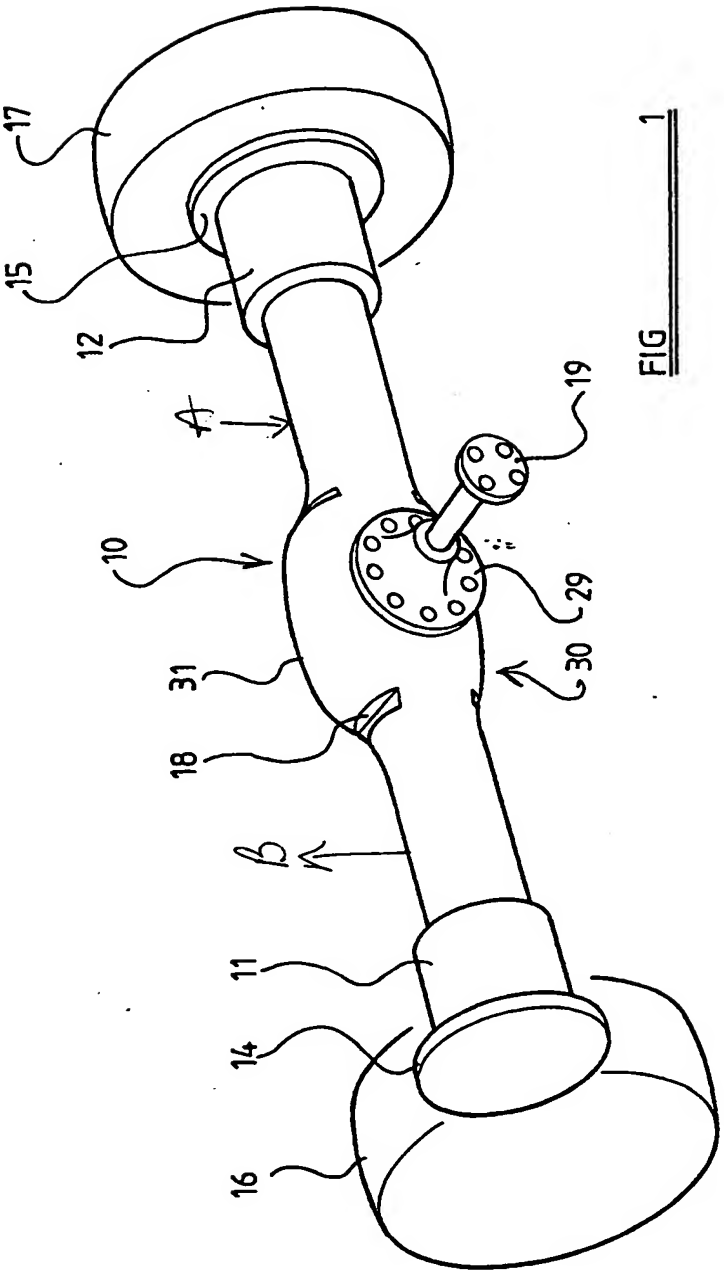

FIG 1

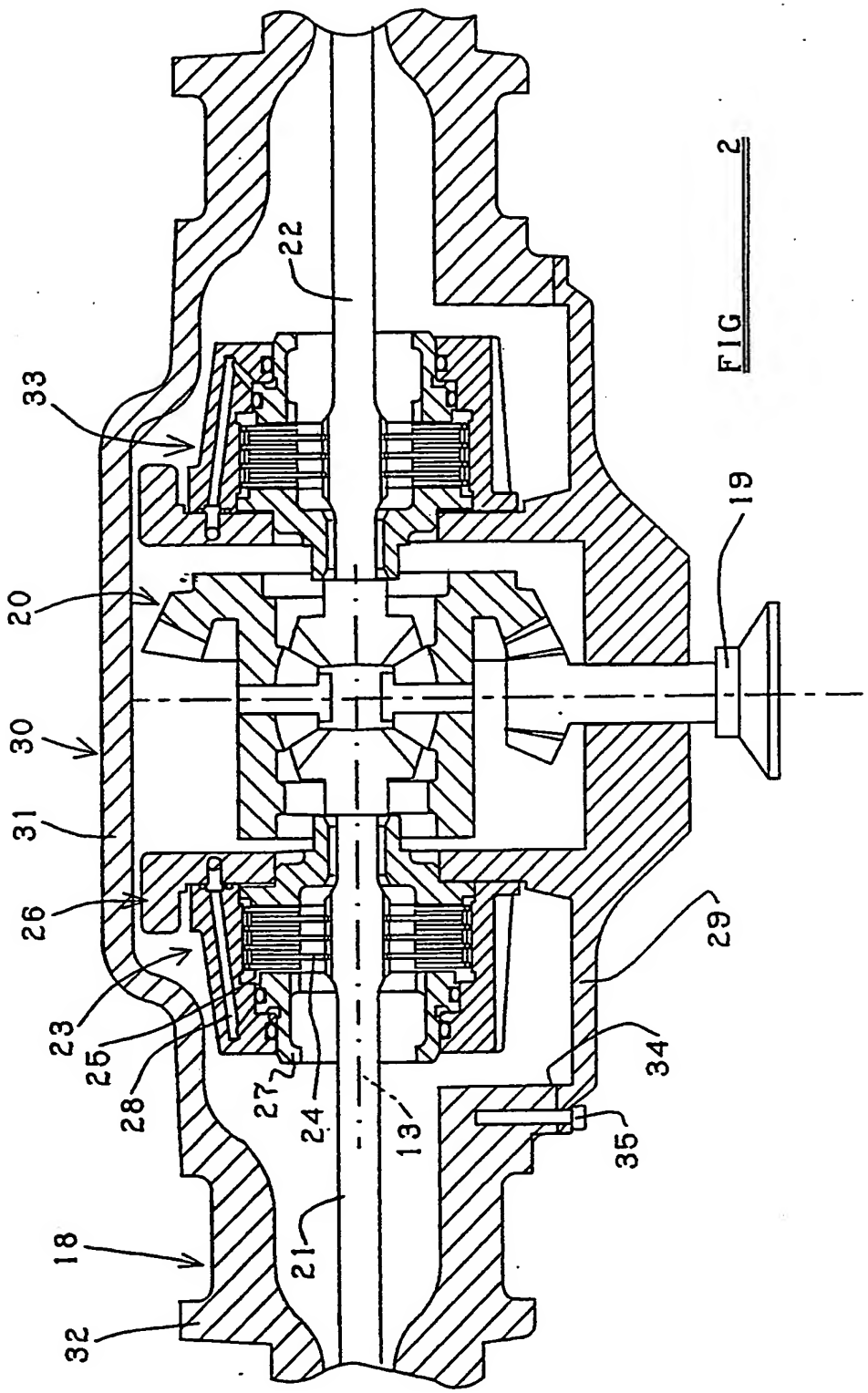

FIG 2

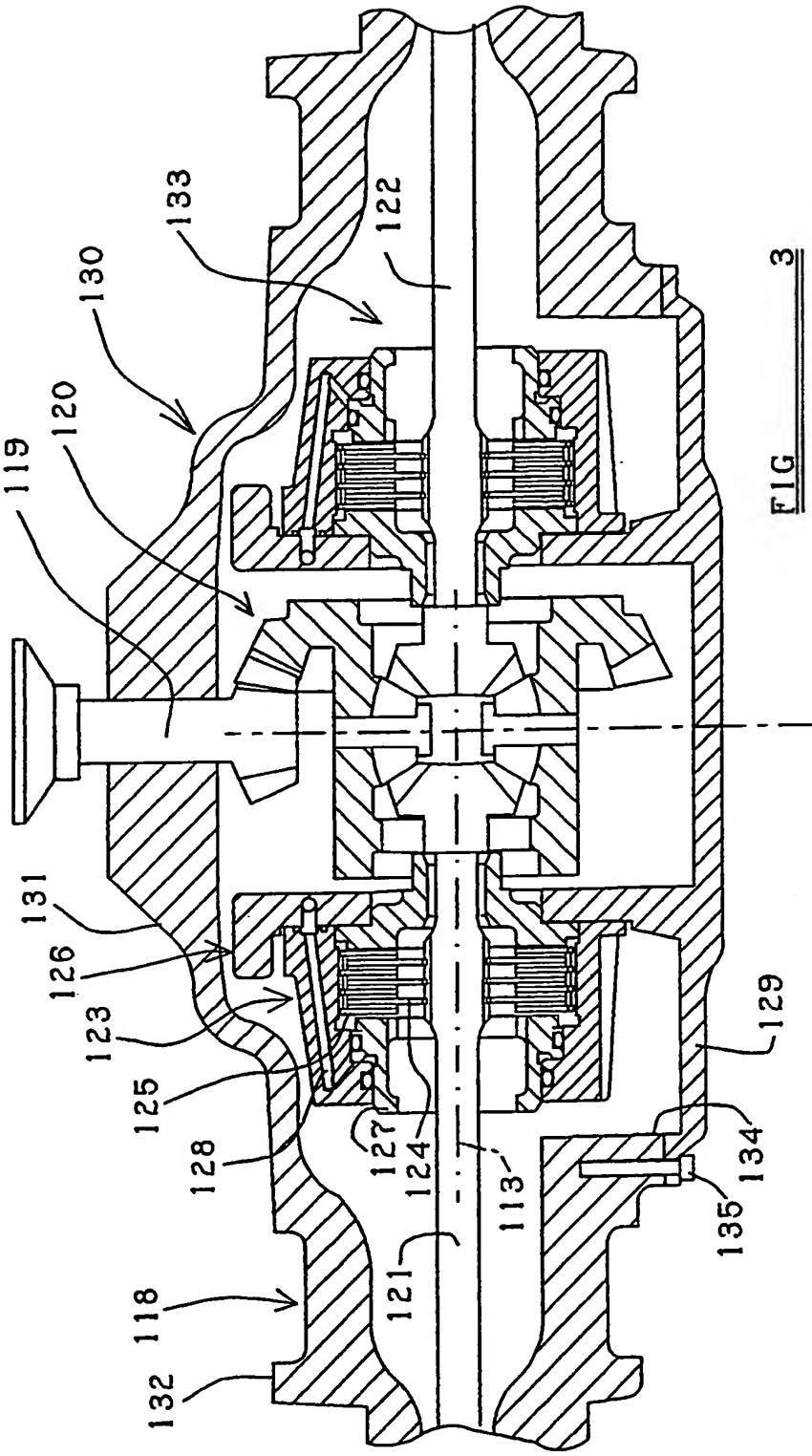
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FIG 3

Title: Axle assembly

Description of Invention

The present invention relates to a driven axle assembly comprising a rotary input element, a pair of drive shafts, a gear train for transmitting drive from the input element to the drive shafts, braking means for braking rotation of the drive shafts and a housing which contains the drive shafts, the braking means and the gear train.

Usually, the gear train of an axle assembly of the kind described is or includes a differential gear train which permits of rotation of the drive shafts at respective different speeds, for example during cornering of a vehicle in which the axles incorporated. The braking means usually comprises two brakes associated with respective ones of the drive shafts. In known axle assemblies of the kind described, the brakes are not readily accessible.

A driven axle assembly according to the present invention comprises a rotary input element, a pair of drive shafts, a gear train for transmitting drive from the input element to the drive shafts, braking means for braking rotation of the drive shafts and a housing which contains the drive shafts, the braking means and the gear train, wherein the housing includes a main body and a carrier releasably secured in a fixed position relative to the main body, wherein the gear train and the braking means are both mounted on the carrier and wherein the gear train, the brakes and the carrier are demountable as a unit from the main body of the housing.

Examples of axle assemblies embodying the invention will now be described, with reference to the accompanying drawings, wherein:

FIGURE 1 is a diagrammatic, perspective view of an axle assembly and associated wheels,

FIGURE 2 shows diagrammatically a cross section through a part of the axle assembly in a plane containing an axis of rotation of drive shafts of the assembly and

FIGURE 3 is a diagrammatic representation similar to Figure 2, illustrating a modified axle assembly.

The axle assembly illustrated in Figures 1 and 2 comprises an elongated housing 10 having respective hubs 11 and 12 mounted on opposite end portions of the housing for rotation relative thereto about a longitudinal axis 13 of the housing. The hubs 11 and 12 include respective flanges 14 and 15 on which road wheels 16 and 17 are mounted in a known manner. It will be understood that, whilst only one wheel is shown associated with each of the flanges, a pair of wheels may be mounted on each of flange.

The axle assembly is intended for use in a self-propelled vehicle which may be a vehicle intended for use on roads or may be a vehicle intended primarily for use on other terrain. The vehicle includes a body (not shown) and a suspension (not shown) for connecting the body with the axle assembly at mounting positions, one of which is indicated by the reference numeral 18 in Figure 1. The vehicle may be identical with a known vehicle, except in respect of the driven axle assembly. The wheels 16 and 17 may be steerable wheels, in which case the hubs 11 and 12 are connected with the housing 10 in a known manner which permits steering movement of the wheels.

The housing 10 contains means for transmitting drive from a rotary input element 19 to the hubs 11 and 12. The housing contains a gear train 20 and a pair of drive shafts 21 and 22 extending from the gear train to respective ones of the hubs 11 and 12. If required, reduction gears may be interposed between the shafts and the hubs in a known manner. In the example illustrated, the gear train is a differential gear train which permits the shafts 21 and 22 to turn at respective different speeds. It will be understood that, in a case where the shafts are required always to turn at the same speed, an alternative gear train may be substituted for the differential gear train.

There is associated with the shaft 21 a brake 23. The brake 23 comprises one or more discs 24 mounted on and connected by splines with the shaft 21 and one or more reaction elements 25 having a facing of friction material which may be a known material. The or each reaction element 25 is mounted on a carrier 26 and thereby constrained against rotation about the axis 13 relative to the housing 10. Provision is made for limited movement of the reaction element or elements along the axis 13 relative to the brake carrier 26 into and out of pressure contact with the discs 24.

For establishing pressure contact between the or each reaction element 25 and the adjacent disc or discs, there is mounted in the brake carrier 26 an annular piston 27, the brake carrier forming a cylinder within which the piston slides along the axis 13. The example of brake illustrated in Figure 2 is hydraulically actuated and a passage 28 is provided to convey oil under pressure to a chamber defined between the piston 27 and the brake carrier 26, in order to displace the piston relative to the brake carrier. It will be understood that other arrangements for displacing the piston relative to the brake carrier may be provided. For example, there may be provided a lever which acts on the piston, has a fulcrum on the brake carrier and which is rocked on its fulcrum by a mechanical linkage. Such a mechanical arrangement may be included, in addition to the hydraulic actuator, for use as a hand-brake.

Movement of the brake discs and reaction elements along the axis 13 away from the piston 27 is limited by a ring supported by the brake carrier 26. A brake 33, which is identical with the brake 23, is associated with the shaft 22.

The brake carrier 26 also supports components of the gear train 20 and supports the input element 19. It will be understood that suitable bearings are interposed between the brake carrier 26 and those components which are supported by the carrier for rotation relative to the carrier. In the assembled vehicle, the input element 19 is connected, via a gear box, with an engine of the vehicle. The gear box may be mounted immediately adjacent to the housing 10

or may be spaced from the axle housing, in which case a Cardan shaft may be provided to transmit drive between the gear box and the axle assembly.

The brake carrier 26 includes a closure portion 29 which forms a part of the housing 10. The housing further comprises a main body 30 which includes the end portions on which the hubs 11 and 12 are mounted, a mid portion 31 and intermediate portions 32 extending between the mid portion and the end portions. The mid portion 31, together with the closure portion 29, defines a chamber containing the brakes 23 and 33 and the gear train 30. The drive shafts 21 and 22 extend through the intermediate portions 32 of the body 30. The mid portion 30 defines an opening 34 which is closed by the closure portion 29 of the brake carrier. The brake carrier is releasably mounted in a fixed position relative to the body 30 by screws, one of which is shown at 35.

As viewed in a direction along the axis of the input element 19, the brakes 23 and 33 and the gear train 30 all lie within an envelope defined by the perimeter of the opening 34 in the body 30. This opening may be circular or of some other shape. The size of the opening 34 is such that, when the screws are removed to release the brake carrier, the brake carrier, the gear train 20 and the brakes 23 and 33 can be withdrawn, as a single unit, from the mid portion 31 of the housing body through the opening 34. It will be understood that, preparatory to withdrawing this unit, the drive shafts 20 and 21 must be withdrawn from the unit along the axis 13. The drive shafts may, however, remain partly in the main body 30 of the housing.

In a case where the input element 19 is connected with a gearbox, it will be necessary either to leave the brake carrier 26 in a fixed position relative to the gear box and to withdraw the main body 30 of the housing from around the brake carrier, or to move both the gear box and the brake carrier relative to the main body 30 of the housing or to disconnect the input element 19 from the gear box, before moving the brake carrier relative to both the gear box and the main body 30 of the axle housing.

It will be seen that the brakes 23 and 33 and the gear train 20 are all contained within the housing 10 and are thereby protected from contamination by extraneous matter. The housing will contain a lubricant when the axle assembly is in use.

The housing body 30 may be an assembly of separately formed components held together, for example, by screws. The brake carrier 26 also may be formed as an assembly of a number of separately formed components. As viewed in a direction perpendicular to the axis 13 and perpendicular to the axis of the input element 19, the carrier 26 has the form of a fork with a pair of limbs spaced apart along the axis 13. Each of these limbs has an aperture through which a corresponding one of the shafts 21 and 22 extends. The gear train 20 is mounted between the limbs of the carrier and the brakes 23 and 33 are mounted at the outsides of the limbs.

In Figure 3, there is illustrated a modification of the axle assembly shown in Figures 1 and 2. In Figure 3, parts corresponding to those hereinbefore described are identified by like reference numerals with the prefix 1. The preceding description is deemed to apply to such corresponding parts, except for the differences hereinafter mentioned.

In the brake assembly of Figure 3, the input element 119 is supported by the main body 130 of the axle housing, not by the brake carrier 126. The opening 134 of the body 130 is at the side thereof opposite to the input element 119. Accordingly, the unit comprising the brake carrier, the brakes 123 and 133 and the gear train 120 can be withdrawn from the body 130 in a direction away from the input element 19 and without disturbing the input element.

If desired, planetary or other gearing may be incorporated into the hubs 11, 12 mounted on the housing 10 of the axle assembly. Alternatively, such gearing may be provided along the drive shafts 21, 22 close to the respective brake 23, 33 so that when the carrier 26 is removed from the main body 30, the planetary gearing is withdrawn with the brake carrier 26, or otherwise is left in the main body 30 preferably at an accessible position. Further alternatively such

gearing may remain in the main body 30 when the carrier 26 is removed, but such gearing being subsequently separable and hence removable from the main body 30.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A driven axle assembly comprising a rotary input element, a pair of drive shafts, a gear train for transmitting drive from the input element to the drive shafts, braking means for braking rotation of the drive shafts and a housing which contains the drive shafts, the braking means and the gear train, wherein the housing includes a main body and a carrier releasably secured in a fixed position relative to the main body, wherein the gear train and the braking means are both mounted on the carrier and wherein the gear train, the braking means and the carrier are demountable as a unit from the main body of the housing.

2. An assembly according to Claim 1 wherein the gear train includes a differential gear train and wherein the braking means includes two brakes, each associated with a respective one of the drive shafts.

3. An assembly according to Claim 2 wherein each brake includes an hydraulic actuator.

4. A method of removing the braking means from an axle assembly as defined in any preceding claim wherein the braking means, the gear train and the carrier, as a single unit, are drawn through an opening defined by the main body of the housing and thereby separated from the main body.

5. An axle assembly substantially as herein described with reference to Figures 1 and 2 of the accompanying drawings.

6. An axle assembly according to Claim 5, modified substantially as herein described with reference to Figure 3 of the accompanying drawings.

7. Any novel feature or novel combination of features disclosed herein or in the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number: 9114799.1

Relevant Technical fields

(i) UK Cl (Edition K) B7D (DFBA, DFBB)

(ii) Int Cl (Edition 5) B60B 35/16

Search Examiner: CRAIG DAVEY

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search: 25-09-91

Documents considered relevant following a search in respect of claims 1-6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 2 061 845 A (BALMFORTH) Claim 1 - page 2 lines 72-85	1

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